WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005GU54B

Title: Heavy Metals in Biotic and Abiotic Components of a Guam Reef Flat Impacted by Leachate from a Municipal Dump

Project Type: Research

Focus Categories: Water Quality, Sediments, Toxic Substances

Keywords: Biota, Heavy Metals, Monitoring

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End Date: 02/28/2006

Federal Funds: $31,627

Non-Federal Matching Funds: $0

Congressional District:

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Abstract

Pago Bay is a fringing reef flat on the eastern shore of central Guam. It harbors a rich diversity of marine life and supports a variety of scientific, commercial and recreational activities. For the past 50 years, leachate streams emanating from Guam's only municipal dump have been making their way down the Lonfit River and out into Pago Bay. Chemical characterization of the leachate streams has identified heavy metals as the contaminants of primary concern both from an ecological and human health perspective. Specific elements flagged as exceeding toxicity thresholds include arsenic, chromium, copper, iron, lead, manganese, mercury, nickel, silver and zinc. Currently, nothing is known about the movement of these potentially toxic elements into the biotic components of Pago Bay. In view of the commercial, recreational and scientific importance of this area, such a study is long overdue. The study described herein proposes to establish baseline levels of the aforementioned metals in biotic and abiotic components of the bay with emphasis on sediments, bioindicator species and dominant fisheries resources

traditionally harvested for food. Surface sediment samples will be collected at ~100-m intervals along the entire length of the bay and at ~100-m to 200-m intervals along five, approximately equally spaced transect lines running perpendicular to the coast. Biota sampling will focus on dominant groups with high bioindicator potential that are either sessile or are restricted in their movement. Potential candidates include algae, seagrasses, seacucumbers, bivalves and gastropod mollusks. These organisms generally have little or no regulatory capacity for some or all of the contaminants in question and hence their tissue levels mirror biologically available amounts derived from their immediate surroundings. They will be collected largely on an opportunistic basis from within the six regions delineated by the sediment transects. The analytical work will be carried out at the Water and Environmental Research Institute (WERI), Water Quality Laboratory, at the University of Guam, where adequate support facilities, infrastructure, essential chemicals and items of equipment necessary for the study are present. The analytical procedures will follow established methods developed by USEPA and NOAA. Quality control and quality assurance procedures will be rigidly adhered. Overall, the study will establish a reliable database with which future findings may be compared and evaluated; delineate areas of contaminant enrichment within the study area, and identify potential hot spots. Further, it will assess the degree of contamination in Pago Bay by reference to levels reported for clean and polluted environments elsewhere in the world. Potential health risks (if any) associated with the long-term consumption of edible resources surveyed will also be evaluated.